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Acquisition Semantics

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Technology Planning
and Management

SUBJECT: Report on Acquisition Semantics

We in the acquisition community often find ourselves in debate and disagreement over what we call the various aspects of our acquisition process. Questions such as "What is a prototype vis-a-vis a proof-of-principle?" have been known to bring otherwise productive meetings to a complete halt.

Because of this, I asked my staff to do some research on the problem and provide some definitive answers from authoritative sources. The result of that effort is this report. Contained within it are the definitions of many of the terms that often trouble us with a brief explanation and example of each.

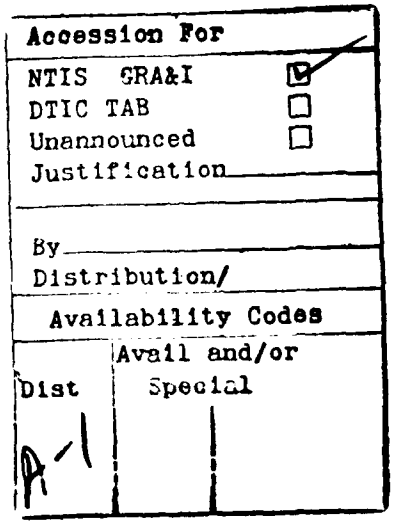
This report is not intended to affect our acquisition policy. Its purpose is to be of service to our community by providing the definitions of some terms based on the latest authority: for the most part, the latest editions of AR 70-1, DODI 5000.1, and DODI 5000.2.

I hope this report will be useful to you, and I urge you to provide for its wide dissemination.

Jerry C. Harrison
Major General, U.S. Army
Deputy Chief of Staff
for Technology Planning
and Management

Foreword

This report is not to be interpreted as a statement of policy, nor does it address policy issues that arise in this area. Rather, it is an enumeration of definitions with accompanying explanatory material from authoritative sources. The definitions are quoted verbatim where possible and the precise reference citations are given. The material in this report is accurate to the extent that it is based on the 15 September 1990 draft of DODD 5000.1 and DODI 5000.2.



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1. Introduction

"The road to wisdom begins with calling things by their right names."

—Chinese proverb

"I don't know how to describe it, but I'll know it when I see it."

—Anonymous

Along with the myriad problems facing the Army acquisition world, including problems of a fiscal, organizational, personnel, and political nature, we have also inflicted upon ourselves a problem of semantics. The acquisition process has become increasingly complex, with milestones, phases, and budget categories. All of these have names, and all these names tend to overlap and confuse. For instance, there have been both ATD's and ATTD's—one an informal, unstructured demonstration of technology, and the other a highly structured program with stringent reporting and fiscal requirements. (Mercifully, this particular problem should disappear, as ATD's have been removed from the latest draft of DODI 5000.2). Army technology base managers often find themselves embroiled in discussions and even program decisions that revolve around these semantic difficulties.

To try to introduce some order into this process, the Army Materiel Command Office of the Deputy Chief of Staff for Technology Planning and Management has compiled a list of terms related to the acquisition process as shown in figure 1. In this document, we define these terms and explain the definitions. We also give an easily understandable example of each and indicate what formal requirements documentation might be related to each of the terms. Finally, we cite the references from which we drew the information.

Figure 1 captures many of these terms related to acquisition and shows the relationships among them. The major sections of this report correspond to those in the figure. This figure shows that there are milestones at which approval must be obtained before a project can proceed from one phase of the acquisition process to the next. Generally, each phase is supported by funds bearing a particular "color," based on which budget category within Program 6 (research, development, testing, and evaluation—RDTE) of the Defense appropriation is used. Work performed under categories 6.1, 6.2, and 6.3A is referred to as the Technology Base. This work provides the foundation for system development, performed under categories 6.3B and 6.4. Finally, a variety of hardware is produced as the process proceeds from phase to phase.

"When I use a word, Humpty Dumpty said, in rather a scornful tone, it means just what I choose it to mean—neither more nor less."

—Lewis Carroll
Through the Looking-Glass

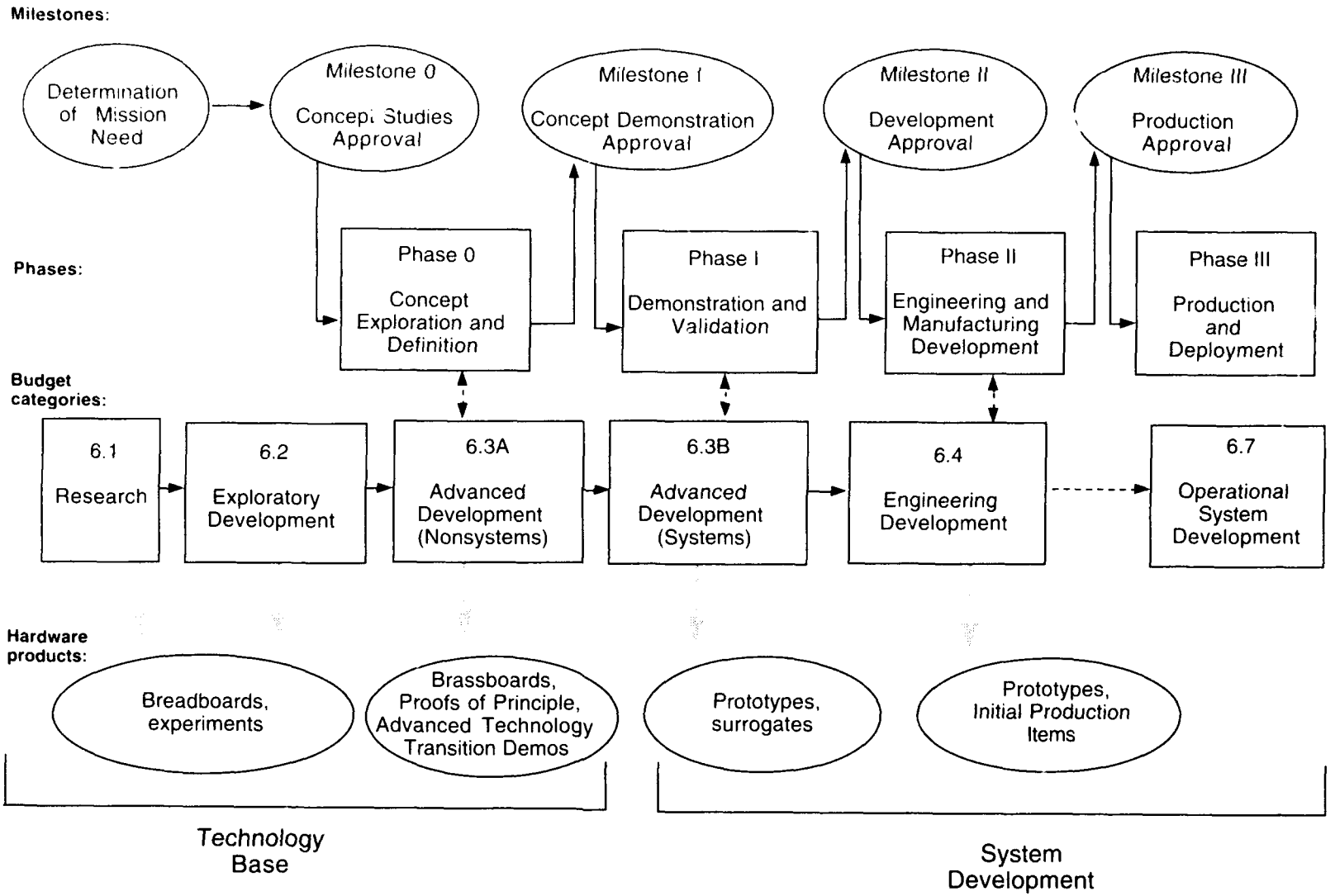

Figure 1. Acquisition relationships.

2. Milestones and Phases

The underlying structure of the DoD Army acquisition strategy is based on a series of four phases, each of which requires approval at a specified milestone before it can begin (table 1 summarizes these milestones and phases).

The acquisition process begins with the determination of mission need, which is generally the province of the user, although technology availability as communicated by the developer may also play a role. Once a need has been articulated and the kind of technology that may be appropriate has been determined, approval at Milestone Zero is sought to enter Phase Zero (concept exploration and definition), during which the specific concept (or concepts) responding to the defined need are explored and fleshed out with some degree of specificity. This phase usually begins at the more mature or advanced end of the technology base (6.3A), as opposed to the more fundamental research end (6.1).

Once the technical concept is displayed in some form of hardware demonstration, approval is sought at Milestone I for the project to begin the early part of system development in which the technical approach is demonstrated and validated (Phase I, demonstration and validation). (Note that the terms "demonstration and validation" and "DEMVAL" refer to a phase of the acquisition chain, *not* to any particular hardware demonstration that might occur during this phase).

Success in Phase I leads to an approval to enter Phase II (engineering and manufacturing development), during which the concept is designed and engineered for producibility. This approval is granted at Milestone II.

At the conclusion of development, approval at Milestone III allows the system to leave development and the RDTE process, and enter the production and deployment phase, Phase III.

In contrast to the formal succession of acquisition phases described above, some believe that a more parallel process of "concurrent engineering" based on the Japanese model is more effective. However, this thinking has not yet been codified in the DoD instructions.

Table 1. Summary of milestones and phases

Term	Significance
Milestone 0	Approval to proceed with concept studies
Phase 0	Define and assess the merits of alternative technical concepts
Milestone I	Approval to demonstrate concept
Phase I	Establish the program cost, schedule, and operational effectiveness of the concept system
Milestone II	Approval for development
Phase II	Engineering of the system in preparation for manufacture
Milestone III	Approval for production
Phase III	Produce and deploy system; supported with production (OPA) funds

2.1 Phase Zero—Concept Exploration and Definition

Definition:

Competitive, parallel, short term studies by the Government and/or industry are normally done during Phase Zero. In this phase, the feasibility of alternative concepts is defined and assessed; these assessments provide the basis for assessing the relative merits of the concepts at the Milestone I decision point, Concept Demonstration Approval.

Explanation/Discussion:

Primary considerations in Phase Zero include (1) assessment of early life-cycle cost estimates; (2) an overall acquisition strategy that will define the most promising system concept(s); and (3) provision for the validation of the technologies and process required to achieve critical characteristics and constraints. During the concept exploration and definition phase, various materiel alternatives are explored to satisfy the documented mission need (a statement of operational capability required to perform or to correct a non–system-specific deficiency); the most promising system concept(s) are defined; supporting analyses and information identifying high-risk areas and risk management approaches to support the Milestone I decision are developed; and a proposed acquisition strategy is developed, as well as initial program objectives for cost, schedule, and performance (both operational and supportability parameters) for the most promising system concept(s).

Example:

Countermine and Barrier Development. Following evolutionary exploratory development, landmine warfare and countermine capabilities undergo advanced development through the investigation and exploitation of materials, techniques, and equipment. This project addresses the Army's highest priority user operational requirements: in-stride detection and breach, and man-portable stand-off and close-in detection of landmines. Mine-detection efforts are applicable both to heavy force scenarios and to low-intensity conflicts. A study was initiated of an integrated breacher system. Competing technologies included reactive munitions, wide-area neutralization devices, and high-power microwave technology.

Required Documentation:

- Milestone Zero decision—Concept Studies Approval (major acquisition programs)
- Operational and Organizational (O&O) Plan
- Mission Need Statement (major and nonmajor acquisition programs)
- Acquisition Decision Memo (ADM)

Reference:

Draft DODI 5000.2, 15 September 1990, Part 3, pages 3-6 and 3-7, paragraph 3b

2.2 Phase I—Demonstration and Validation (DEMVAL)

Definition:

The demonstration and validation phase is that part of the life cycle in which multiple design approaches and parallel technologies are pursued within the system concept(s). Work performed in this phase establishes the broad program cost, the schedule, and operational effectiveness and suitability goals and thresholds. Maximum flexibility is allowed for the development of innovative and cost-effective solutions.

Explanation/Discussion:

Primary considerations during Phase I include (1) early integration of supportability and manufacturing processes into the system(s) design effort; (2) prototyping, testing, and early operational assessment of critical systems, subsystems, and components; (3) identification and reduction of risk; (4) assessment of design approach in the operational environment; and (5) cost, schedule, and performance tradeoffs of design approach(es). During the demonstration and validation phase, the technologies and processes critical to the most promising system concept(s) are understood and proven to be attainable; critical design characteristics and expected capabilities of the system concept(s) are better defined; analyses and information needed to support a Milestone II decision are developed; and a proposed development baseline is established containing refined program cost, schedule, and performance objectives for the most promising design approach.

Example:

Light Helicopter (LH). During DEMVAL the LH will provide for essential system-level application and demonstration of technologies, such as integrated tri-service common avionics architecture, advanced target acquisition and night vision sensors, and increased speed and altitude. The objectives of this program are to finalize system requirements and reduce technical, supportability, producibility, cost, and schedule risk for the follow-on phase.

Required Documentation:

- Milestone I decision—Concept Demonstration Approval
- Concept baseline approved at Milestone I
- Acquisition Decision Memo (ADM)
- Integrated Program Summary (IPS)
- Test and Evaluation Master Plan (TEMP)
- Operational Requirements Document (ORD)

References:

- Draft DODI 5000.2, 15 September 1990, Part 3, pages 3-13 and 3-143, paragraph 3d
- AR 70-1, 10 October 1988, Appendix C, page 51, paragraphs D.2.b and c

2.3 Phase II—Engineering and Manufacturing Development (Formerly Full-Scale Development)

Definition:

Phase II includes the engineering, integration, testing, and evaluation of a system (including necessary training devices, threat simulators, test equipment, and computer resources). Work performed in this phase establishes detailed program cost, schedule, and performance parameters and refined program objectives.

Explanation/Discussion:

Typically in Phase II, low-rate initial production of selected components, subsystems, end items, and quantities is approved for two general purposes. Initial production allows manufacturing or production processes to be verified; it also provides test resources needed for the performance of production qualification, live fire, and interoperability tests, which result in the acceptance of Initial Operational Test and Evaluation (IOTE) results before the full-rate production decision at Milestone III. The purpose of this phase is to complete subsystem design and development, assuring that the system is operationally effective and suitable in its operational environment, meets the user requirements, and achieves readiness for production.

Example:

Forward Area Air Defense (FAAD) Ground Base Sensor (GBS). The FAAD GBS will provide continuous volume surveillance, acquisition, and tracking of aircraft over the division area of influence in all weather, day, and night battlefield environments, including threat countermeasures. The GBS is organic to all FAAD battalions. It consists of a radar sensor; FAAD command, control, and intelligence interface; vehicle; prime power generator; and communications and identification equipment. Preproduction/low-rate initial production models will be developed for technical, verification, and integrated testing, as well as IOTE.

Required Documentation:

- Operational Requirements Document (ORD)
- Integrated Program Summary (IPS)
- Acquisition Decision Memorandum (ADM)
- Development Baseline approved at Milestone II

Reference:

DODI 5000.2, 15 September 1990, Part 3, pages 3-20 and 3-21, paragraph 3f

2.4 Phase III—Production and Deployment

Definition:

The production and deployment phase is characterized by a sustaining rate of production and initial fielding of the materiel system, together with its full complement of support equipment, publications, and services. In this phase, system performance and quality are evaluated. Updated objectives and thresholds for key cost, schedule, and performance parameters are established.

Explanation/Discussion:

In Phase III, operational units are trained, equipment is procured and distributed, and logistical support is provided. A stable, efficient production and support base is established; an operational capability that satisfies the identified mission need is achieved; and follow-on operational and production verification testing is conducted to confirm and monitor performance and quality. Program budget execution status and the results of field experiments are reviewed. Particular attention will be on the performance of the system as intended.

Example:

120-mm Mortar System. Phase III work on the nondevelopmental 120-mm mortar supports qualification of this weapon and completes the development of the family of enhanced ammunition. This item has been fielded to the 9th Infantry Division. A follow-on operational test of the enhanced ammunition with final carrier weapon configuration is to be conducted.

Required Documentation:

- Milestone III decision—Production Approval
- Production Baseline approved at Milestone III
- Operational Requirements Document (ORD)

Reference:

DODI 5000.2, 15 September 1990, Part 3, page 3-26, paragraph 3h

3. Budget Categories

Congress appropriates the Defense budget. The Defense Department allocates this appropriation among a number of programs, of which program 6 (research, development, testing, and evaluation—RDTE) supports the acquisition process up to the point of production. Program 6 is subdivided into a number of budget categories. The funds in each category are used to support the different parts of the acquisition process, which (theoretically at least) moves sequentially, beginning at basic research (6.1) and progressing through engineering development (6.4), at which point the program moves into another part of the Defense budget for procurement and production (see fig. 1).

Budget categories 6.1, 6.2, and 6.3A support the technology base, which, as the name implies, provides the basis or foundation in technology upon which the development of systems may occur. The formal part of the acquisition process does not begin until Milestone Zero approval, which corresponds (usually) to the onset of 6.3A funding support. By this time, the laws of nature and physical principles have been investigated and sufficient laboratory work has been done to give some confidence that a military system might evolve from the specific technical concept.

Categories 6.3B and 6.4 support advanced and engineering development, respectively, wherein the system and its associated support are developed to the point where sustained rates of production can be maintained and materiel fielding can be initiated.

Category 6.7 is a special category for systems that are already fielded, but which must be returned to the RDTE process for improvements, modifications, or fixes to problems that have surfaced during use.

One other category, 6.5, is not shown, as it is not directly part of the acquisition stream, but rather provides the underlying management and administrative support to many of the organizations and institutions that carry out the RDTE program.

In figure 1, the acquisition process begins with Milestone Zero and Phase Zero, coinciding with 6.3A. From this point on formalized management processes, schedules, milestones, etc, govern the progress of a program through the process. Categories 6.1 and 6.2 predate Milestone Zero and, as such, are not subject to such rigorous scheduling as the later phases. Although this lenience is sometimes criticized, a less formal management style is appropriate for work that is so basic in nature, whose results can often not be foretold.

It is wrong to imagine that a typical program proceeds in an idealized lockstep form from 6.1 through 6.4 and then into production, as shown in figure 1. In fact, most programs do not start until 6.3A or sometimes even

6.3B. Sometimes 6.1 and 6.2 programs are criticized as being disconnected or even irrelevant to the development process. In fact, the results of 6.1 and 6.2 projects generally find their way into development and production programs through indirect channels, such as technology insertion during product improvement programs, or, sidestepping the whole acquisition process, via the private sector in the form of contractor proposals to Project Managers.

One final note of explanation: the definitions of 6.3A and 6.3B are sometimes misunderstood, stretched, confused, or even ignored. However, Draft DODI 5000.2, 15 September 1990, clearly states the distinctions among Proofs of Principle, Advanced Technology Transition Demonstrations, and Prototypes (see sect. 5). Thus, it is possible to clarify the distinctions between 6.3A and 6.3B work on the basis of their outputs.

3.1 Category 6.1—Research

Definition:

Funding in category 6.1 supports scientific study and experimentation directed toward increasing knowledge and understanding in those fields of the physical, engineering, environmental, biological/medical, and behavioral/social sciences related to long-term national security needs.

Explanation/Discussion:

Research includes investigations of the laws of nature and fundamental physical processes. This research provides fundamental knowledge for solution of identified military problems. It also provides part of the knowledge base through which technological improvements to the warfighting capability can be assessed and implemented.

Example:

Research in Missiles and High-Energy Lasers. Research to provide the science base for future technology development in missiles and high-energy lasers is currently focused on photonics, optical computers, nonlinear optical materials, integrated optics, laser photochemistry, missile system research, and laser science. New neural network mathematical algorithms basic to automatic target recognition have been developed, and captive-carry tests were conducted of an advanced optical correlator guidance system against real targets in clutter. Examples of continuing research are the study of optical architectures for implementation of neural networks in automatic target recognition and pattern recognition, and the development of faster, cheaper, more sensitive image modulators.

Required Documentation:

A variety of informal statements of need or program objectives (these could also include Science and Technology Objectives (STO's), as found in the Army Technology Base Master Plan).

References:

- AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340-11, paragraph E.3.b(1)
- AR 70-1, 10 October 1988, Chapter 6, page 33, paragraph 6-6a(1)

3.2 Category 6.2—Exploratory Development

Definition:

Category 6.2 is a funding category for technology efforts that are directed toward the solution of specific military problems short of major development projects.

Explanation/Discussion:

Exploratory development may vary from fairly fundamental applied research to sophisticated models, techniques, and simulations that are needed to optimize product development. The dominant characteristic of this category of effort is that it takes the fundamental knowledge discovered in 6.1 and points it toward specific military problem areas, with a view toward developing and determining their parameters.

Example:

Missile Technology. Efforts in missile and rocket technology are focused on technologies that support high fire power/logistic-support weight ratio concepts for the Light Forces, allow system concepts that enhance the survivability of launch systems, provide greater effectiveness under adverse battlefield conditions, and increase kill probabilities against hard targets. A few examples of what has been achieved in this area are evaluation of noncooperative target-recognition techniques, completion of the designs for a dual-mode seeker (millimeter wave/infrared), preparation of the procurement specifications for the focal plane array seeker, and the design and fabrication of ballistic autopilot hardware.

Required Documentation:

A variety of informal statements of need or program objectives (these could also include Science and Technology Objectives (STO's), as found in the Army Technology Base Master Plan).

References:

- AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340–11, paragraph E.3.b(2)
- AR 70-1, 10 October 1988, Chapter 6, page 33, paragraph 6-6b(1)

3.3 Category 6.3A—Advanced Development (Nonsystem)

Definition:

Funding category 6.3A supports all technology base projects in which the feasibility and utility of the approach selected is demonstrated through testing of components, subsystems, and experimental systems.

Explanation/Discussion:

Advanced development involving nonsystems is characterized by the development of generic components and subsystems, Advanced Technology Transition Demonstrations (ATTD's), and nonmaterial technological demonstrations. Potential applications are to a variety of similar generic end products and may or may not be supported by a Mission Need Statement (MNS). Advanced development provides the path for rapid insertion of new technology into Army systems and addresses technological options and uncertainties in nonsystem RDTE efforts.

Note: Advanced development corresponds to Phase Zero, concept exploration and definition.

Example:

Rotary-Wing Controls and Rotors. The objective of the project on rotary-wing controls and rotors is to develop and demonstrate man/machine rotors and control technology to enhance helicopter pilotage capability and increase maneuverability and agility, with reduced vibration and maintenance. Rotorcraft crew stations will be developed using automation and artificial intelligence (AI). This project will contribute to the Rotorcraft Pilot's Associate (RPA).

Required Documentation:

- Milestone Zero decision—Concepts Studies Approval (required for the initiation of a major system program only).
- A Mission Need Statement (MNS) may be required.
- Acquisition Decision Memorandum (ADM).

References:

- AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340-11, paragraph E.3.b(3)
- AR 70-1, 10 October 1988, Chapter 6, Section II, page 33, paragraphs 6-6c(1) and (3)(a)

3.4 Category 6.3B—Advanced Development (System)

Definition:

Category 6.3B funds system-specific projects that have moved into developing hardware for experimental or operational testing.

Explanation/Discussion:

Advanced development efforts involving a unique or specific well-defined system objective are undertaken in response to an approved Mission Need Statement (MNS) and initial Operational Requirements Document (ORD). Systems advanced development is to demonstrate that technical maturity has been achieved and that technical risk in initiating engineering and manufacturing development is low. Advanced development addresses technological options and uncertainties in system RDTE efforts.

Note: Advanced development corresponds to Phase I, demonstration and validation (DEMVAL).

Example:

Fire and Forget Common IR Seeker. The Fire and Forget Common IR Seeker project will develop/improve existing munitions with effective seekers, while providing increased lethality and range. This project aims to develop autonomous gun-hardened seekers for multisystem applications. The seekers are being developed to detect, discriminate, and guide various Army delivery vehicles (105-mm, 120-mm, or 155-mm) to defeat armor targets.

Required Documentation:

- Milestone I decision—Concept Demonstration Approval
- Mission Need Statement (MNS)
- Acquisition Decision Memorandum (ADM)
- Integrated Program Summary (IPS)
- Test and Evaluation Master Plan (TEMP)
- Operational Requirements Document (ORD)

References:

- AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340-11, paragraph E.3.b(3)
- AR 70-1, Chapter 6, Section II, pages 33–34, paragraphs 6-6c(1) and (3)(b)

3.5 Category 6.4—Engineering Development

Definition:

Category 6.4 funds development programs being engineered for service use, but which have not yet been approved for procurement or operation.

Explanation/Discussion:

Engineering development pertains to products that are being engineered for military service use in accordance with an approved Operational Requirements Document (ORD) but which have not yet been type classified. It is characterized by line-item projects and tasks under those projects. Program control is exercised by review of individual projects and their specific end-item tasks. Engineering development is characterized by major line-item projects.

Note: Engineering development corresponds to Phase II, Engineering and Manufacturing Development.

Example:

Aviation Life Support Equipment (ALSE). The ALSE project will provide engineering development of life-support items peculiar and necessary to the Army aircrews for survival on the integrated battlefield and related training scenarios. Survivability items include eyesight protection against emerging threat lasers, integrated with greatly improved lightweight helmet technology and cooling for aircrew encumbered in nuclear, biological, and chemical (NBC) protective gear during desert or tropic operations to prevent incapacitating heat stress. ALSE makes battlefield survivability possible and enhances the air crew's ability to return to fight.

Required Documentation:

- Milestone II decision—Developmental Approval
- Acquisition Decision Memorandum (ADM)
- Integrated Program Summary (IPS)
- Test and Evaluation Master Plan (TEMP)
- Operational Requirements Document (ORD)
- Integrated Logistics Support Plan (ILSP)

Reference:

AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340-11, paragraph E.3.b(4)

3.6 Category 6.7—Operational System Development

Definition:

Category 6.7 includes research and development efforts directed toward development, engineering, and testing of systems; support programs; and vehicles and weapons that change the performance envelope of a system that has been approved for production and field/service employment.

Explanation/Discussion:

All items in this area are major line-item projects that appear as RDTE costs of weapons systems elements in other programs. Program control is exercised by review of the individual research and development effort in each weapon system element.

Example:

Patriot Product Improvement Program. Patriot is an advanced medium- to high-altitude surface-to-air guided missile. In operational system development, radar enhancements, out-of-sector launch software, and an antiradiation decoy are integrated into the system, as well as upgrades to the Weapons Control Computer (WCC). Further improvements will also address modifications to the pulse Doppler waveform search/track capability.

Required Documentation:

- Milestone IV decision—Developmental Approval
- Acquisition Decision Memorandum (ADM)
- Integrated Program Summary (IPS)
- Acquisition Strategy Report (ASR)—an annex to the IPS
- Test and Evaluation Master Plan (TEMP)
- Operational Requirements Document (ORD)
- Integrated Logistics Support Plan (ILSP)

Reference:

AR 37-100-90, 1 July 1989, Volume II, Chapter 340, page 340-11, paragraph E.3.b(6)

4. Acquisition Categories and System Program Definitions

RDTE programs that pass out of the technology base and through Milestone Zero into development will focus on a "system," that is, some identifiable end-item of materiel that will be procured in some quantity and stockpiled and/or deployed with the field Army. These system development programs have a categorization of their own, depending for the most part on the size of the R&D or procurement funding or the level of authority required for milestone decisions.

4.1 Acquisition Categories

All acquisition programs, excluding highly sensitive classified programs, are placed into one of four categories:

Acquisition Category I.

Programs in category I are major defense acquisition programs. They have unique statutorily imposed acquisition strategy, execution, and reporting requirements. Milestone decision authority for these programs is as follows:

for acquisition category I D, the Under Secretary of Defense (Acquisition) or his delegate,

for acquisition category I C, the cognizant DoD component head or, if delegated, the DoD component acquisition executive.

Acquisition Category II.

Programs in category II are major systems. They have unique statutorily imposed requirements in the test and evaluation area and may have statutorily imposed requirements in other areas, such as defense enterprise programs and multiyear procurement. Milestone decision authority for these programs is delegated no lower than the DoD component acquisition executive.

Acquisition Category III.

Programs in category III are nonmajor systems. Such programs may also have statutorily imposed requirements in areas such as live-fire test and evaluation and multiyear procurement. Milestone decision authority for this category can be delegated by the DoD component executive to the lowest level deemed appropriate within an organization.

Acquisition Category IV.

Category IV programs are all other acquisition programs for which the milestone decision authority should be delegated to a level below that required for category III. Milestone decision authority for this category can be delegated by the DoD component executive to the lowest level deemed appropriate within an organization. Such programs may also have statutorily imposed requirements in areas such as live-fire test and evaluation and multiyear procurement.

Reference:

DODI 5000.2, 15 September 1990, Part 2, pages 2-2 through 2-4, paragraphs B.2.b(1) to (3)

4.2 System Program Definitions

1. **Major Defense Acquisition Program**. A major defense acquisition program is one that is not a highly sensitive classified program (as determined by the Secretary of Defense) and
   a. is designated by the Under Secretary of Defense (Acquisition) as a major defense acquisition program, or
   b. is estimated by the Under Secretary of Defense (Acquisition) to require
      (1) an eventual total expenditure for research, development, test, and evaluation of more than $200M in fiscal year 1980 constant dollars (approximately $300M in fiscal year 1990 constant dollars), or
      (2) an eventual total expenditure for procurement of more than $1B in fiscal year 1980 constant dollars (approximately $1.8B in fiscal year 1990 constant dollars).
2. **Non–Major Defense Acquisition Program**. A non-major defense acquisition program is one that is not a major defense acquisition program nor a highly sensitive classified program.
3. **Major System**. A major system is a combination of elements that will function together to produce the capabilities required to fulfill a mission need; these elements include hardware, equipment, software, or any combination thereof, but not construction or other improvements to real property. A system is considered a major system if it is estimated by the Under Secretary of Defense (Acquisition) to require
   a. an eventual total expenditure for research, development, test, and evaluation of more than $75M in fiscal year 1980 constant dollars (approximately $115M in fiscal year 1990 constant dollars), or
   b. an eventual total expenditure for procurement of more than $300M in fiscal year 1980 constant dollars (approximately $540M in fiscal year 1990 constant dollars).

References:

- DODD 5000.1, 15 September 1990, page 2, paragraph 2, and page 3, paragraph 4
- DODI 5000.2, 15 September 1990, page 3, paragraphs C.4 through C.6

5. Hardware Products

Various products and demonstrations result from the various phases of the acquisition process (table 2 summarizes hardware products). We attempt to define the principal terms for these products and demonstrations, although many of them are used quite loosely (thereby generating controversy). Some of the terms do in fact fit a spectrum of meanings and situations.

Table 2. Summary of hardware products

Name	Funding type	Goal	User involved	Environment
Breadboard	6.1/6.2	Determine technical feasibility/generate data	No	Lab
Experiments	6.1/6.2	Demonstrate technical feasibility/practicality of new technologies	No	Lab
Brassboard	6.3A	Determine feasibility/demonstrate technical and operational principles	No	Lab/field
Proof of principle	6.3A	Demonstrate technical approach/operational capability	No	Lab/field
Advanced Technology Transition Demonstration (ATTD)	6.3A	Evaluate integrated technologies/assess performance payoff or cost reduction potential before prototyping begins	Yes	Operational
Prototype	6.2B/6.4	Assess and reduce risk of integrated available and emerging technologies	Yes	Operational

5.1 Breadboard

Definition:

A breadboard is an experimental device (or group of devices) used to determine technical feasibility and to develop technical data.

Explanation/Discussion:

The device is used in a laboratory environment to demonstrate technical principles. Breadboards are usually built in 6.2 programs.

Example:

A breadboard could be a laboratory model of a design, used to verify initial technical performance: for instance, a collection of electronic components on a temporary circuit board, monitored by laboratory instruments.

Required Documentation:

Laboratory Notebook

5.2 Brassboard

Definition:

A brassboard is an experimental device (or group of devices) used to determine feasibility and to develop technical and operational data.

Explanation/Discussion:

Normally a brassboard is a model sufficiently hardened for use outside the laboratory environment to demonstrate both technical and operational principles of immediate interest. It may resemble the end item, but is not intended for use as such. A brassboard is usually built during a 6.3A program.

Example:

A brassboard might be an advanced signal processing circuit packaged for field testing.

Required Documentation:

Army Technology Base Master Plan, which projects the development and maturation of technologies for the Army's future systems.

Reference:

AR 70-1, 10 October 1988, Glossary, Section II, page 87

5.3 Technology Demonstration

Definition:

Technology demonstrations are development programs that encourage technical competition and occur during basic research, exploratory development, and advanced technology development.

Explanation/Discussion:

Technology demonstrations are generally focused on technology developments required to solve specific military deficiencies. They are most often conducted in a nonoperational environment (at various times in 6.1, 6.2, and 6.3A) providing information that reduces uncertainties and subsequent engineering costs, while simultaneously providing valuable development and requirements data. During basic research and exploratory development, technology demonstrations may be experiments that are used to demonstrate the feasibility and practicality of new technologies; during advanced technology development, they may be experiments demonstrating the general military utility or cost-reduction potential of technology applied to the different types of military equipment or techniques. Advanced technology development might include proof-of-principle demonstrations and advanced technology transition demonstrations (see sect. 5.4 and 5.5).

Example:

Air-to-Air Mission Equipment Weapons Demonstration (AAMWD). The AAMWD project provides for the demonstration of aircraft weaponization technologies such as multisensor fusion and Hydra 70 rockets. An integrated system approach will be used to address the voids and deficiencies identified in the Army Aviation Mission Area Analysis and the U.S. Army Training and Doctrine Command Battlefield Development Plan. This program will demonstrate the capabilities to be derived from a fully integrated weapons suite/equipment package and define the criteria necessary to provide air superiority.

Required Documentation:

Army Technology Base Master Plan, which projects the development and maturation of technologies for the Army's future systems.

References:

- DODI 5000.2, 15 September 1990, Part 5, Section C, page 5-C-2, paragraph 3c
- Army Technology Base Master Plan—Coordinated Draft 1990, Volume I, Chapter II, page II-3, paragraph B.2.b

5.4 Proof of Principle

Definition:

A proof of principle is a technical demonstration that is used to demonstrate, in a nonoperational environment, innovative technologies that will support system upgrades or provide new operational capabilities.

Explanation/Discussion:

The proof-of-principle process examines the organization and operational concept, provides data to improve requirements and evaluation criteria, and provides data on which to base the decision to enter engineering and manufacturing development (previously known as full-scale development).

Example:

Smart Submunition Warhead. A proof-of-principle demonstration was performed for a two-color infrared seeker in a terminally guided submunition for the Army tactical missile system, Multiple Launch Rocket System (MLRS), and the 155-mm howitzer system.

Required Documentation:

Army Technology Base Master Plan, which projects the development and maturation of technologies for the Army's future systems.

References:

- AR 70-1, 10 October 1988, Glossary, Section II, page 92
- Army Technology Base Master Plan—Working Draft 1990—Volume I, Chapter II, page II-4, paragraph B.3.b
- DODI 5000.2, 15 September 1990, Part 5, Section C, page 5-C-2, paragraph 3c

5.5 Advanced Technology Transition Demonstration (ATTD)

Definition:

ATTD's are experimental test programs of hardware that are designed for evaluation/integration of technical feasibility, technical approach, and operational concept.

Explanation/Discussion:

ATTD's provide the opportunity for the technology developer, program manager, and program executive officer to communicate with the Army user; together, they can formulate systems concepts that become the basis for the completion and fielding of next-generation systems. ATTD's are risk-reducing, integrated proof-of-principle demonstrations conducted in an operational environment rather than a laboratory environment, and encourage the active participation of the user community. ATTD's are used to expedite technology transition from the laboratory to operational use. The ATTD approach is advocated by the Defense Science Board and the Army Science Board as a means of accelerating the introduction of new technologies into operational systems. ATTD's are intended to demonstrate that the technology barriers that inhibit low-risk systems development have been overcome, and they may also be used to prove the feasibility of satisfying an operational need or to support realistic cost estimates. ATTD's occur during 6.3A programs. The word "transition" in ATTD indicates the goal of transitioning to the engineering and manufacturing development phase (formerly full-scale development).

Note: Technology transition is a major element of Phase Zero—concept exploration and definition.

Example:

Chemical/Biological Defense Systems. The project on chemical/biological defense systems establishes an ATTD program in the areas of agent detection and identification, decontamination, individual and collective protection, and munitions. This program will speed the maturation of advanced technologies to reduce risk in system-oriented advanced development.

Required Documentation:

- Acquisition Decision Memorandum (ADM)
- Technology Development Plan (TDP)

References:

- AR 70-1, 10 October 1988, Glossary, Section II, page 87
- DODI 5000.2, 15 September 1990, Part 5, Section C, page 5-C-3, paragraph 3c(2)(b)
- Army Technology Base Master Plan—Coordinated Draft 1990—Volume I, Chapter I, page I-14, paragraph E.3.b, and Chapter II, page II-3, paragraph B.2.a
- Report of the 1987 Defense Science Board Summary Study on Technology Base Management

5.6 Prototype

Definition:

A prototype is a model/system design that integrates available and emerging technologies (e.g., hardware, software, and manufacturing processes), assesses technical approaches, and demonstrates low risks in order to satisfy a validated mission need.

Explanation/Discussion:

Prototyping confirms the feasibility of a specific system design approach relative to its ability to satisfy the mission need and to achieve minimum acceptable operational performance requirements within affordability constraints. It is used to assess cost and performance tradeoffs and to define program objectives for the development baseline and the contract specifications for Phase II, engineering and manufacturing development. Prototypes are developed to reduce the risk associated with the integration of technologies, to determine the applicability of technology demonstrations, and to provide an opportunity for early operational assessment.

Note: Prototyping is a major element of Phase I, demonstration and validation. Prototyping may continue into Phase II, engineering and manufacturing development. It is usually related to 6.3B or 6.4 funding.

Example:

Light Helicopter (LH) Air Vehicle. The LH project provides for the development of a model/system design LH that will integrate technologies. The LH will replace the current light fleet of tactically obsolescent helicopters. This project will provide leap-ahead combat lethality and battlefield survivability to defeat the threat of the mid-1990's. The LH will correct the major light fleet deficiencies such as marginal night and adverse weather capability; position location/navigation accuracy; and inadequate reliability, performance, and survivability.

Required Documentation:

- Milestone I—Concept Demonstration Approval
- Operational Requirements Document (ORD)
- Integrated Program Summary (IPS)
- Test and Evaluation Master Plan (TEMP)

Reference:

DODI 5000.2, 15 September 1990, Part 5, Section D, page 5-D-2, paragraph 3b

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This report discusses some of the terms used in the acquisition process to describe the various phases, milestones, categories, etc. Misinterpretation and lack of understanding often leads to confusion among those responsible for carrying out the process. The authors have gone to the original documents to provide the precise definitions with references, examples, and explanations for each of these words. It is the intent of this report to provide a common ground of understanding for those involved in materiel acquisition.

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